

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

WHAT IS CLAIMED IS:

1. A medical instrument comprising a housing having an opening at one end thereof; a first shaft within said housing for reciprocal motion, said first shaft having a front section and a rear section, said front section of said shaft extending adjacent said opening in said housing; a cam assembly within said housing, said cam assembly comprising first and second cam followers arranged in spaced apart relationship on said first shaft, a cam arranged between said first and second cam followers mounted on a rotatable second shaft, said cam having outwardly facing first and second cam profiles respectively engaging an opposing one of said first and second cam followers, whereby said cam assembly upon rotation of said cam converting rotating motion of said second shaft to reciprocal motion of said first shaft.

2. The instrument as claimed in claim 1, wherein said first shaft is arranged along a first axis and said second shaft is arranged along a second axis parallel to said first axis.

3. The instrument as claimed in claim 1, further including a motor coupled to said second shaft for rotation thereof.

4. The instrument as claimed in claim 1, wherein said first and second cam profiles are symmetrical.

5. The instrument as claimed in claim 1, wherein said first and second cam profiles are non-symmetrical.

6. The instrument as claimed in claim 1, wherein said cam comprises a cylindrical body having first and second spaced apart surfaces respectively providing said first and second cam profiles.

7. The instrument as claimed in claim 1, further including a coupling device attached to said

front section of said first shaft extending outwardly of said housing, said coupling device operative for releasable attachment of a needle thereto.

8. The instrument as claimed in claim 7,  
5 further including a needle attached to said coupling device.

9. The instrument as claimed in claim 1,  
further including a connector having a closed end  
10 attached to said front section of said first shaft outwardly of said housing, said connector operative for attachment of a vacuum source thereto.

10. The instrument as claimed in claim 9,  
further including a needle releasably coupled to said connector.

11. The instrument as claimed in claim 1,  
15 further including electronic control means for controlling the operation of said instrument.

12. A medical instrument comprising a housing  
having an opening at one end thereof; a reciprocating  
20 shaft within said housing, said reciprocating shaft having a front section and a rear section, said front section of said reciprocating shaft extending outwardly through said opening; a cam assembly within said housing operatively coupled to said reciprocating shaft, said cam  
25 assembly comprising a cam having first and second spaced apart outwardly facing cam profiles, a first cam follower on one side of said cam in engagement with said first cam profile, and a second cam follower on the other side of said cam in engagement with said second cam profile; and  
30 a motor operatively coupled to said cam for rotational movement of said cam, whereby said engagement of said first and second cam profiles with said first and second cam followers during rotation of said cam causes reciprocal movement of said reciprocating shaft.

13. The instrument as claimed in claim 12, wherein said first and second cam followers are mounted to said reciprocating shaft.

14. The instrument as claimed in claim 13,  
5 wherein said cam is mounted on a rotatable shaft within said housing.

15. The instrument as claimed in claim 14, wherein said motor within said housing is coupled to said rotatable shaft for rotation thereof.

10 16. The instrument as claimed in claim 12, further including a needle attached to said front section of said reciprocating shaft outwardly of said housing.

17. The instrument as claimed in claim 16, further including a coupling device for releasably  
15 coupling said needle to said reciprocating shaft.

18. The instrument as claimed in claim 12, wherein said first and second cam followers are fixedly attached to said housing on opposite sides of said cam.

19. The instrument as claimed in claim 18,  
20 wherein said cam is mounted on said reciprocating shaft.

20. The instrument as claimed in claim 19, wherein said motor includes a shaft having an axis parallel to an axis of said reciprocating shaft.

21. The instrument as claimed in claim 19,  
25 further including a first gear within said housing rotatable by operation of said motor, and a second gear arranged circumferentially about said cam, said first and second gears being in sliding meshed engagement, whereby rotation of said first gear causes rotation of said cam  
30 for rotation of said reciprocating shaft, and the engagement of said first and second cam followers with said cam causing reciprocating movement of said reciprocating shaft.

22. The instrument as claimed in claim 21,  
35 wherein said cam has an axis of rotation colinear with an

axis of rotation of said reciprocating shaft and parallel to an axis of rotation of said first gear.

23. The instrument as claimed in claim 12, where said first and second cam profiles control the stroke length of said reciprocating shaft.

24. The instrument as claimed in claim 12, further including a needle attached to said front section of said shaft outwardly of said housing, and means for creating a vacuum in said needle.

25. The instrument as claimed in claim 12, further including electronic control means for controlling the operation of said instrument.

26. A medical instrument comprising a housing having an opening at one end thereof; a reciprocating shaft along a first axis within said housing, said reciprocating shaft having a front section and a rear section, said front section of the shaft extending outwardly through said opening; a cam assembly within said housing comprising a cam having first and second spaced apart cam profiles, a first cam follower on one side of said cam in engagement with said first cam profile, and a second cam follower on the other side of said cam in engagement with said second cam profile; and a motor on a second axis within said housing operatively coupled to said cam for rotational movement of said cam, said second axis offset from said first axis, whereby rotation of said cam causes reciprocal movement of said reciprocating shaft.

27. The instrument as claimed in claim 26, wherein said first and second cam followers are mounted to said reciprocating shaft.

28. The instrument as claimed in claim 27, wherein said cam is mounted on a rotatable shaft within said housing.

29. The instrument as claimed in claim 26, further including a needle attached to said front section of said shaft outwardly of said housing.

5 30. The instrument as claimed in claim 29, further including a coupling device for releasably coupling said needle to said shaft.

31. The instrument as claimed in claim 26, wherein said first and second cam followers are fixedly attached to said housing on opposite sides of said cam.

10 32. The instrument as claimed in claim 31, wherein said cam is mounted on said reciprocating shaft.

33. The instrument as claimed in claim 32, further including a motor within said housing operatively coupled to said cam for rotation thereof.

15 34. The instrument as claimed in claim 33, further including a first gear within said housing rotatable by operation of said motor, and a second gear arranged circumferentially about said cam, said first and second gears being in sliding meshed engagement, whereby  
20 rotation of said first gear causes rotation of said cam for rotation of said reciprocating shaft, and the engagement of said first and second cam followers with said cam causing reciprocating movement of said reciprocating shaft.

25 35. The instrument as claimed in claim 26, wherein said first and second cam profiles are non-symmetrical.

30 36. The instrument as claimed in claim 26, where said first and second cam profiles control the stroke length of said reciprocating shaft.

37. The instrument as claimed in claim 26, further including a needle attached to said front section of said shaft outwardly of said housing, and means for creating a vacuum in said needle.

38. The instrument as claimed in claim 26, further including electronic control means for controlling the operation of said instrument.

5 39. A medical instrument comprising a housing having an opening at one end thereof; a shaft within said housing for reciprocal motion, said shaft having a front section and a rear section, said front section of said shaft extending outwardly through said opening of said housing; a motor within said housing; and a cam assembly  
10 within said housing comprising a cam operationally coupled to said motor for rotational movement of said cam, said cam having a track and a cam follower fixed to said housing and received within said track; whereby receipt of said cam within said track during rotation of  
15 said cam by said motor causes reciprocal movement of said shaft.

40. The instrument as claimed in claim 39, further including a coupling attached to said motor and coupled to said cam.

20 41. The instrument as claimed in claim 40, wherein said cam comprises a body having a bore therein and said coupling sliding received within said bore.

42. The instrument as claimed in claim 41, further including means for preventing relative rotation  
25 between said coupling and said cam when said coupling is received within said bore, whereby rotation of said coupling causes rotation of said cam and reciprocal and rotational motion of said shaft.

30 43. The instrument as claimed in claim 42, wherein said shaft is attached to said cam in longitudinal alignment therewith.

44. The instrument as claimed in claim 39, further including a bearing coupling said shaft to said cam, whereby rotation of said cam causes reciprocal  
35 motion of said shaft while said bearing prevents rotational motion of said shaft.

45. The instrument as claimed in claim 39, further including a needle releasably coupled to said shaft outwardly of said housing.

5 46. The instrument as claimed in claim 45, further including means for creating a vacuum in said needle.

47. The instrument as claimed in claim 39, further including electronic control means for controlling the operation of said instrument.

10 48. The instrument as claimed in claim 39, wherein said cam assembly controls the stroke length of said shaft.